



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/533,805

10/26/2005

Raynald Labrecque

0055676-000013

4174

21839

7590

03/05/2009

BUCHANAN, INGERSOLL & ROONEY PC  
POST OFFICE BOX 1404  
ALEXANDRIA, VA 22313-1404

EXAMINER

TAI, XIUYU

ART UNIT

PAPER NUMBER

1795

NOTIFICATION DATE

DELIVERY MODE

03/05/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ADIPFDD@bipc.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/533,805	<b>Applicant(s)</b> LABRECQUE ET AL.	
	<b>Examiner</b> Xiuyu Tai	<b>Art Unit</b> 1795	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12/32008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 95-133, 136-140, 142-162 and 168-192 is/are pending in the application.
- 4a) Of the above claim(s) 99-102, 105, 106, 127-131, 133, 136-140, 142-162 and 168-190 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 96-98, 103, 104, 107-126, 132, 191 and 192 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 October 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/5/2005 &amp; 3/30/2006</u> .                                | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Claims 99-102, 105, 106, 127-131, 133, 136-140, 142-162, 168-190 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Furthermore, claims 134, 135, 141, and 163-167 are cancelled. Applicant timely traversed the restriction (election) requirement in the reply filed on 12/3/2008.

The traversal is on the ground(s) that the inventions of Group I, II and III relate to a single general inventive concept under PCT Rule 13.1 and must be examined together. This is not found persuasive because the difference between the method of prior art and that of the instant invention is not the "special technical feature". Although the inventions of Group I, II and III share the special technical feature, this special technical feature does not define a contribution over the prior art for the following reasons: "reforming a gas comprising at least one possibly substituted hydrocarbon, and /or at least one possibly substituted organic compound in the presence of an oxidizing gas" is the special technical feature linking Group I, Group II and Group III. "reforming a gas comprising at least one possibly substituted hydrocarbon, and /or at least one possibly substituted organic compound in the presence of an oxidizing gas " is known in the art, such as "CO<sub>2</sub> reforming of methane by the combination of dielectric-barrier discharges and catalysis" by Kraus et al, *Phys. Chem. Chem. Phys.*, 2001, 3, 294-300. Accordingly, the special technical feature does not

Art Unit: 1795

provide a contribution over the prior art. Therefore, restriction for examination purposes as indicated in Office Action mailed on 9/4//2008 is proper.

The restriction requirement is still deemed proper and therefore made FINAL.

### ***Drawings***

2. The drawings are objected to under 37 CFR 1.83(a) because Figure 9 fails to clearly show the outlet electrode has no opening towards the center while this is the case for the inlet electrode as described in the specification. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and

Art Unit: 1795

informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

3. Claims 96-98, 103, 104, 107-126, 132, and 191-192 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. As recited in claim 96, "conductive filling material" constitutes an indefinite subject matter. The instant specification fully supports the description of "conductive lining material"; however, it does not clearly describe "porous conductive filling material which defines as a whole or in part a reforming catalyst". The description of "filling" and "filling material" in the specification (last paragraph on page 28 and the first paragraph on page 29) does not appear consist with the claimed subject matter. Therefore, appropriate correction/clarification is required. For the purpose of examination, "conductive filling material" is interpreted as "conductive lining material" as defined in the instant specification. Claims 97-98, 103, 104, 107-126, 132, and 191- 192 are rejected because of their dependency and failure to remove the ambiguity of parent claim.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to

Art Unit: 1795

be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 96-98, 104, 107-110, 113-115, 117-122, -, , 132,191, and 192 are rejected under 35 U.S.C. 103(a) as being unpatentable over in view of Mallinson et al (U.S. 6,159,432) and in view of Fletcher et al (U.S. 3,771,959).and in evidence of Predtechensky (U.S. 6,846,467) and Maskalick (U.S. 4,447,509).

Art Unit: 1795

9. Regarding claim 96, Mallinson et al disclose a gas stream conversion apparatus. The apparatus comprises: (1) a housing 20 (Figure 1A; col. 8, line 11) which may be fabricated from a conductive material with a non-conductive coating on the interior surface 21 (col. 8, line 22-24); (2) a reaction zone that is spaced within the housing 20 between a first electrode 30 and a second electrode 40 (Figure 1A; col. 9, line 46-47) and a catalyst material 90 that may be disposed on one of the two electrodes 30/40 (Figure 2A; col. 11, line 16-23); (3) a gas introduction assembly 12 for introducing the gas stream into the housing (Figure 1A; col. 8, line 66-67); (4) a collecting assembly 70 (Figure 1A) for any reaction product effluent to exit the housing 20 (col. 9, line 4-5); (5) a power source 7 connected to at least one of the two electrodes 30/40 (Figure 1A; col. 8, line 32-33). It should be noted that the gas stream may contain primarily methane (i.e. gas to be reformed) in the form of natural gas and natural gas may contain oxygen, carbon dioxide, and carbon monoxide (i.e. oxidizing gases, col. 8, line 35-42).

Although Mallinson does not teach a conductive catalyst, Predtechensky shows that iron is an equivalent catalyst for reforming gas containing hydrocarbons (col. 5, line 24-29 of Predtechensky). Because two catalysts are art-recognized equivalent, one having ordinary skill in the art would have found it obvious to substitute catalyst of Mallinson for conductive metal iron as a catalyst.

Mallison fails to teach porous lining material. Fletcher teaches that the catalyst is preferably used in a fiber-like form such as steel wool (col. 3, line 50-52), Fletcher further indicates that the use of the steel wool as the source of the

Art Unit: 1795

catalytic iron increases surface area for better reforming process (col. 3, line 52-53). Therefore, it would be obvious for one having ordinary skill in the art to utilize steel wool as the source of the catalytic iron as suggested by Fletcher in the device of Mallison in order to efficiently reform reactant gases.

10. Regarding claim 98, the reaction zone of Mallison is within a cylindrical housing 20 (Figure 1A), reads on the instant claim.

11. Regarding claim 104, the catalyst of Predtechensky is iron (col. 5, line 24-29), reads on the instant claim.

12. Regarding claim 97, the catalyst of Predtechensky is iron (col. 5, line 24-29), reads on the instant claim.

13. Regarding claim 107, iron is a conductive metal, which is inherent to have the claimed physical characteristics.

14. Regarding claim 108, Predtchensky teaches scrap irons (col. 4, line 66), reads on the instant claim.

15. Regarding claim 109, Malison teaches that a catalyst material 90 that may be disposed on one of the two electrodes 30/40 (Figure 2A; col. 11, line 16-23) which has gas passageways 60 (Figure 1A; col. 9, line 19-22). With respect to the required openings, one having ordinary skill in the art would have realized to optimize the size of passageways 60 in order to allow gas reactants/conversion products to pass through electrodes without huge pressure drop.

16. Regarding claim 110, the catalyst of Fletcher is steel wool (col. 3, line 50-52), reads on the instant claim.



Art Unit: 1795

17. Regarding claims 113, 114, and 119, Fletcher teaches that the catalyst is preferably used in a fiber-like form such as steel wool (col. 3, line 50-52).

Fletcher states that if too coarse a form of iron is used, there is less surface area and the process accordingly does not run efficiently (col. 3, line 52-53).

Therefore, one having ordinary skill in the art would have realized to optimize the fiber size, pore size/porosity of the fiber in order to achieve greater surface area, hence efficiently reforming the reactant gases.

18. Regarding claim 115, the gas introduction assembly 12 of Mallison is perpendicular to the direction of the electronic flux generated between two electrodes 30/40, reads on the instant claim.

19. Regarding claim 117, the collecting assembly 70 of Mallison is at the second end 24 while the introduction assembly 12 is at the first end 23 (Figure 1A; col. 8, line 12-15), reads on the instant claim.

20. Regarding claim 118, it is well known in the art that a transformer is used to energize electrodes for generating arc discharge. With respect to the cited equation, it represents optimization of the power consumption based on process-limiting parameters, such as the geometry of the reactor, the type of lining material, the operating conditions, and gas to be reformed. One having ordinary skill in the art would have been obvious to optimize power consumption in order to efficiently reform reactant gases with minimum power consumption.

21. Regarding claim 120, one having ordinary skill in the art would have realized to optimize flow rate of reactants (i.e. residence time) in order to complete gas conversion within the reactor.

Art Unit: 1795

22. Regarding claim 121, Predtechensky teaches scrap iron as catalyst (col. 5, line 24-29 of Predtechensky) and Fletcher teaches steel wool as the source of catalytic iron (col. 3, line 50-52). It would have been obvious to combine iron catalyst with different shapes as taught by Predthensky/Fletcher to yield predictable results.

23. Regarding claim 122, the housing 20 of Mallison may be fabricated from a conductive material with a non-conductive coating on the interior surface 21 (col. 8, line 22-24), reads on the instant claim.

24. Regarding claim 132, it has been held that a device having claimed relative dimension would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (see M.P.E.P. 2144).

25. Regarding claim 191, the catalyst of Predtechensky is iron (col. 5, line 24-29), reads on the instant claim.

26. Regarding claim 192, it is known in the art that the steel wool is basically a low carbon steel as is evident by the teaching of Maskalick (col. 3, line 46-47), reads on the instant claim.

27. Claims 103, 111, 112, and 123-125 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mallinson et al (U.S. 6,159,432) and Fletcher et al (U.S. 3,771,959).) as applied to claim 96 above, and further in view of Pevere et al (U.S. 2,858,261)

28. Regarding claim 103, Mallinson does not teach each of electrodes consisting of a tubular member that is part of gas supplying duct. However,

Art Unit: 1795

Pevere et al disclose an acetylene generator with an electric arc. The generator utilizes hollow tubular electrodes 15 for arc discharge and delivering plasma forming gas such as nitrogen and/or water vapor/oxygen (Figure 1; col. 1, line 70 & col. 2, line 9-10). Pevere further indicates that the use of hollow tubular electrodes for introduction of the plasma forming gas is preferred because of efficient and economic reason (col. 4, line 14-17). Therefore, it would be obvious for one having ordinary skill in the art to modify the device of Mallison by combining the gas introduction assembly 12 with the first electrode 30 as suggested by Pevere in order to efficiently reform reactant gas with low cost. The combined teaching of Mallison/Pevere results in a reactor comprising electrodes that have a hollow tubular structure for introduction gas and a plate member with gas passageways, wherein a catalyst material is disposed on the plate member of the electrode.

29. Regarding claim 111, Fletcher teaches the iron catalyst should be pre-activated by etching in order to decrease time to initially establish gas reforming (col. 5, line 41-42), reads on the instant claim.

30. Regarding claim 112, Fletcher further suggests that the steel wool catalyst (as the source of catalytic iron) is treated with a 3% hydrochloric acid solution of 2-5 min, and then rinsed with distilled water and finally fried in an oven at 230F for about 30 min (col. 5, line 44-47), reads on the instant claim.

31. Regarding claim 123, the two electrodes of Mallison are fabricated as disk having passageways 60 (Figure 1A; col. 9, line 19-22) and one having ordinary skill in the art would have realized to optimize the size of passageways 60 (hence

Art Unit: 1795

the density of the passageway) in order to allow gas reactants/conversion products to pass through electrodes without huge pressure drop.

32. Regarding claim 124, one having ordinary skill in the art would have realized to optimize the size of passageways 60 (hence the density of the passageway) in order to allow gas reactants/conversion products to pass through electrodes without huge pressure drop.

33. Regarding claim 125, the passageways 60 are uniformly distributed on the electrodes 30/40 (Figure 1A), reads on the instant claim.

34. Claim 116 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mallinson et al (U.S. 6,159,432) and Fletcher et al (U.S. 3,771,959) as applied to claim 96 above, and further in view of Predtechensky (U.S. 6,846,467).

35. Regarding claim 116, Mallison/Fletcher does not teach the gas introduction assembly 12 being tangentially to the wall. However, Predthensky disclose a plasma-chemical reactor for gas reforming. The reactor comprises gas channels 8 for plasma forming gas, one end of which tangentially enters the vortex chamber 9 (Figure; col. 5, line 12-15). Predtchensky indicates that tangential entrance can induce vortex formation which stabilizes the arc discharge (col. 3, line 42-45). Therefore, it would be obvious for one having ordinary skill in the art to utilize a tangential entrance of gas as suggested by Predtchensky in order to stabilize the arc discharge forming within the device of Mallison/Fletcher.

Art Unit: 1795

36. Claim 126 is rejected under 35 U.S.C. 103(a) as being unpatentable over Mallinson et al (U.S. 6,159,432) and Fletcher et al (U.S. 3,771,959) as applied to claim 123 above, and further in view of Hoecker (U.S. 6,615,588)

37. Regarding claim 126, Mallison/Fletcher fails to teach the opening size of perforated plated being variable. However, Hoecker disclose an arrangement for using a plate shaped element with through openings for cooling a component. Hoecker teaches that the opening of the through opening s4 increase in the flow direction in proportion to the distance traversed of the cooling duct 5 (Figure 3; col. 5, line 44-46) in order to achieve uniform cooling effect in air flow (col. 2, line 51-56). Therefore, it would be obvious for one having ordinary skill in the art to utilize the arrangement of variable opening size along the perforated plate as suggested by Heocker in the device of Mallison/Fletcher in order to achieve uniform gas distribution along the electrode plate.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xiuyu Tai whose telephone number is 571-270-1855. The examiner can normally be reached on Monday - Friday, 7:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on 571-272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1795

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/X. T./  
Examiner, Art Unit 1795

2/20/2009

/Alexa D. Neckel/  
Supervisory Patent Examiner, Art Unit 1795